ON THE INSIDE

Peter V. Minorsky

EDITORIAL

Associate Editor Graham Farquhar Receives Honors for His Research in Plant Physiology and Climate Change.  Mike Blatt

UPDATES

[Wi]Potassium Ion Channels: Could They Have Evolved from Viruses?  Gerhard Thiel, Anna Moroni, Guillaume Blanc, and James L. Van Etten

Phylogenetic analyses of small viral K+ channels suggests that they did not originate from their hosts, but instead could be the source of the postulated pore precursor in the evolution of K+ channels.

BREAKTHROUGH TECHNOLOGIES


A combinatorial approach of small RNA expression analysis with ARGONAUTE immunoprecipitation data and global cleavage data of RNA ends leads to a global picture of Arabidopsis microRNAs.

[Cr][Wi][OA]GoldenBraid 2.0: A Comprehensive DNA Assembly Framework for Plant Synthetic Biology.  Alejandro Sarrion-Perdigones, Marta Vazquez-Vilar, Jorge Palacios, Bas Castelijns, Javier Forment, Peio Ziarsolo, Jose Blanca, Antonio Granell, and Diego Orzaez

GoldenBraid 2.0 is a comprehensive technological framework that facilitates the construction of increasingly complex multigene structures and exchange of genetic building blocks.

RESEARCH ARTICLES

BIOCHEMISTRY AND METABOLISM


Ribosome loading is closely coordinated with the sucrose supply during diurnal cycles in Arabidopsis.


Comparison of the agronomic and metabolic trait variation between drought-sensitive and drought-tolerant wheat crosses uncovers novel correlations between agronomic traits and the levels of certain metabolites as well as important regions on the wheat genome that require further investigation.
A triacylglycerol lipase knockout boosts the oil content of wild-type plants and transgenic plants genetically engineered to make more oil.

Spatiotemporal analysis during developmental senescence provides a rich catalog of metabolites in relation to leaf and silique development in Arabidopsis.

A novel type of allosteric regulation in divergent cyclophilins engages disulfide bond formation and a loop-displacement mechanism.

The bark beetle-vectored fungus Ceratocystis polonica degrades stilbenoid defense compounds produced by its conifer host.

Tissue-specific transcriptional regulation determines the differences in oil content and fatty acid composition of oil palm fruit and seed tissues.

Nonredundant and specialized functions of the zein prolamines control maize protein body formation and endosperm texture.

Linkages of leaf and mesophyll cell traits to CO₂ diffusion, photosynthesis, transpiration, and water use efficiency were identified across accessions of the genus Oryza.

Differences in drought survival strategies of conifer species are linked to the interaction between hormone dynamics and water tension in the water transport system.
**Arabidopsis Enhanced Drought Tolerance**

**HOMEODOMAIN GLABROUS11 Confers Drought Tolerance in Transgenic Rice without Yield Penalty.**

Linhui Yu, Xi Chen, Zhen Wang, Shimei Wang, Yuping Wang, Qisheng Zhu, Shigui Li, and Chengbin Xiang

AtEDT1/HDG11 improves stress tolerance and grain yield in rice.

**PYR/RCAR Receptors Contribute to Ozone-, Reduced Air Humidity-, Darkness-, and CO2-Induced Stomatal Regulation.**

Ebe Merilo, Kristiina Laanemets, Honghong Hu, Shaoyu Xue, Liina Jakobson, Inqmar Tulve, Miguel Gonzalez-Guzman, Pedro L. Rodriguez, Julian I. Schroeder, Mikael Broschê, and Hannes Kollist

Signaling through abscisic acid PYR/RCAR receptors plays a fundamental role in controlling whole-plant stomatal conductance and affects stomatal closure in response to low air humidity, darkness, O3, and elevated CO2.

**GENES, DEVELOPMENT, AND EVOLUTION**

**Localized Induction of the ATP-Binding Cassette B19 Auxin Transporter Enhances Adventitious Root Formation in Arabidopsis.**

Poornima Sukumar, Gregory S. Maloney, and Gloria K. Muday

Localized synthesis of an auxin transport enhances local IAA accumulation in excised Arabidopsis hypocotyls and drives the formation of adventitious roots.

**The Moss Physcomitrella patens Reproductive Organ Development Is Highly Organized, Affected by the Two SHI/STY Genes and by the Level of Active Auxin in the SHI/STY Expression Domain.**

Katarina Landberg, Eric R.A. Pederson, Tom Viaene, Behruz Bozorg, Jiﬁ Friml, Henrik Jönsson, Mattias Thelander, and Eva Sundberg

Reproductive organ development of the moss Physcomitrella patens is affected by two SHI/STY genes and the plant hormone auxin.

**Functional Implication of β-Carotene Hydroxylases in Soybean Nodulation.**

Yun-Kyoung Kim, Sunghan Kim, Ji-Hyun Um, Kyunga Kim, Sun-Kang Choi, Byung-Hun Um, Suk-Woo Kang, Jee-Woong Kim, Shinichi Takaichi, Seok-Bo Song, Choong-Hwan Lee, Ho-Seung Kim, Ki Woo Kim, Kyoung Hee Nam, Suk-Ha Lee, Yul-Ho Kim, Hyang-Mi Park, Sun-Hwa Ha, Desh Pal S. Verma, and Choong-Ill Cheon

Carotenoids are essential for nodule development in soybean.

**Redox Modulation of Plant Developmental Regulators from the Class I TCP Transcription Factor Family.**

Ivana L. Viola, Leandro N. Güttein, and Daniel H. Gonzalez

The activity of class I TCP transcription factors is modulated by cellular redox agents both in vitro and in vivo, suggesting their role in developmental redox control in plants.

**Suspensor Length Determines Developmental Progression of the Embryo in Arabidopsis.**

Yashodar Babu, Thomas Musielak, Agnes Henschen, and Martin Bayer

Embryo suspensor length is crucial for fast developmental progression in Arabidopsis seed.

**The role of TIR-NBS and TIR-X proteins in plant basal defense responses.**

Raja Sekhar Nandety, Jeffery L. Caplan, Keri Cavanaugh, Bertrand Perroud, Tadeusz Wroblewski, Richard W. Michelmore, and Blake C. Meyers

TIR-NBS and TIR-X proteins are novel plant proteins with activities indicative of roles in plant defense.
The Cotton Transcription Factor TCP14 Functions in Auxin-Mediated Epidermal Cell Differentiation and Elongation. Miao-Ying Wang, Pi-Ming Zhao, Huan-Qing Cheng, Li-Bo Han, Xiao-Min Wu, Peng Gao, Hai-Yun Wang, Chun-Lin Yang, Nai-Qin Zhong, Jian-Ru Zuo, and Gui-Xian Xia

GhTCP14 is a dual-function transcription factor able to positively or negatively regulate expression of auxin response and transporter genes, and it may act as a crucial regulator in auxin-mediated differentiation and elongation of cotton fiber cells.

MEMBRANES, TRANSPORT, AND BIOENERGETICS


Coexpression and promoter analysis under iron deficiency in roots of Arabidopsis and Medicago demonstrates the integral role for production and secretion of compounds that facilitate the uptake of reduction-based iron acquisition.

Vacuolar Transport of the Medicinal Alkaloids from Catharanthus roseus Is Mediated by a Proton-Driven Antiport. Inês Carqueijeiro, Henrique Noronha, Patricia Duarte, Hernãmi Gerôs, and Mariana Sottomayor

A specific H⁺ antiport system mediates the vacuolar uptake of terpenoid indole alkaloids in Catharanthus roseus.

Glutamate Receptor-Like Channel3.3 Is Involved in Mediating Glutathione-Triggered Cytosolic Calcium Transients, Transcriptional Changes, and Innate Immunity Responses in Arabidopsis. Feng Li, Jing Wang, Chunli Ma, Yongxiu Zhao, Yingchun Wang, Aguda Hasi, and Zhi Qi

Extracellular glutathione triggers innate immunity responses in the Arabidopsis leaf through a glutamate receptor3.3-dependent pathway homologous with that of the central nervous system.

A Suppressor Screen of the Chimeric AtCNGC11/12 Reveals Residues Important for Intersubunit Interactions of Cyclic Nucleotide-Gated Ion Channels. Huda Abdel-Hamid, Kimberley Chin, Wolfgang Moeder, Dea Shahinas, Deepali Gupta, and Keiko Yoshioka

A small subset of residues is essential for Arabidopsis CNGC12 channel subunit interaction.

SIGNALING AND RESPONSE

Structural Determinants at the Interface of the ARC2 and Leucine-Rich Repeat Domains Control the Activation of the Plant Immune Receptors Rx1 and Gpa2. Erik J. Slootweg, Laurentiu N. Spiridon, Jan Roosien, Patrick Butterbach, Rikus Pomp, Lotte Westerhof, Ruud Wilbers, Erin Bakker, Jaap Bakker, Andrei-Jose´ Petrescu, Geert Smant, and Aska Goverse

Cooperative interactions between the sensor domain and the molecular switch domain of plant immune receptors are structurally defined.

TWIN SISTER OF FT, GIGANTEA, and CONSTANS Have a Positive But Indirect Effect on Blue Light-Induced Stomatal Opening in Arabidopsis. Eigo Ando, Masato Ohnishi, Yin Wang, Tomonao Matsushita, Aiko Watanabe, Yuki Hayashi, Miho Fuji, Jian Feng Ma, Shin-ichiro Inoue, and Toskinori Kinoshita

Stomatal opening is indirectly modulated by a mechanism similar to that of the photoperiodic floral transition.

Phototropins Function in High-Intensity Blue Light-Induced Hypocotyl Phototropism in Arabidopsis by Altering Cytosolic Calcium. Xiang Zhao, Yan-Liang Wang, Xin-Rong Qiao, Jin Wang, Lin-Dan Wang, Chang-Shui Xu, and Xiao Zhang

High-intensity blue light induces increases in [Ca²⁺]cyt, which are mostly attributed to the function of phot2 and phot1, required for phototropism in Arabidopsis hypocotyls.
Interplay between Sucrose and Folate Modulates Auxin Signaling in Arabidopsis.  
Michael E. Stokes, Abhishek Chattopadhyay, Olivia Wilkins, Eiji Nambarn, and Malcolm M. Campbell

Sugar and folate fine-tune hormone sensitivity and distribution to shape plant seedling development.

The Arabidopsis ETHYLENE RESPONSE FACTOR1 Regulates Abiotic Stress-Responsive Gene Expression by Binding to Different cis-Acting Elements in Response to Different Stress Signals.  
Mei-Chun Cheng, Po-Ming Liao, Wei-Wen Kuo, and Tsan-Piao Lin

The transcriptional regulator ERF1 plays a positive role in salt, drought, and heat stress tolerance by integrating hormonal signals.

Yana Kazachkova, Albert Batushansky, Aroldo Cisneros, Noemi Tel-Zur, Aaron Fait, and Simon Barak

Eutrema salsugineum maintains its salt tolerance under very different growth conditions even though its development and metabolism show substantial growth condition-dependent differences.

Regulation of Transcription of Nucleotide-Binding Leucine-Rich Repeat-Encoding Genes SNC1 and RPP4 via H3K4 Trimethylation.  
Shitou Xia, Yu Ti Cheng, Shuai Huang, Joe Win, Avril Soards, Tsung-Luo Jinn, Jonathan D.G. Jones, Sophien Kamoun, She Chen, Yuelin Zhang, and Xin Li

MOS9 and ATXR7 contribute to the transcriptional regulation of Resistance genes SNC1 and RPP4 residing in the RPP4 cluster.

GIGANTEA Enables Drought Escape Response via Abscisic Acid-Dependent Activation of the Florigens and SUPPRESSOR OF OVEREXPRESSION OF CONSTANS1.  
Matteo Riboni, Massimo Galbiati, Chiara Tonelli, and Lucio Conti

Floral transition under drought conditions is accelerated by enabling ABA-dependent up-regulation of the florigen genes.

The Trehalose 6-Phosphate/SnRK1 Signalling Pathway Primes Growth Recovery following Relief of Sink Limitation.  

The T6P/SnRK1 mechanism of growth regulation responds to sink growth restriction and recovery following low-temperature limitation.

SYSTEMS AND SYNTHETIC BIOLOGY

System-Wide Hypersensitive Response-Associated Transcriptome and Metabolome Reprogramming in Tomato.  

A novel set of HR-related genes and secondary metabolites depends on WRKY transcription factors in tomato.

The Arabidopsis RING E3 Ubiquitin Ligase AtAIRP3/LOG2 Participates in Positive Regulation of High-Salt and Drought Stress Responses.  
Jong Hum Kim and Woo Taek Kim

A ubiquitin ligase has dual functions in ABA-mediated drought stress and in amino acid export in Arabidopsis.

Genome-Wide Detection of Condition-Sensitive Alternative Splicing in Arabidopsis Roots.  
Wenfeng Li, Wen-Dar Lin, Prasun Ray, Ping Lan, and Wolfgang Schmidt

Transcriptional profiling of roots subjected to iron and phosphate deficiency revealed stress-specific changes in splicing patterns that are largely independent of differential gene expression, providing a mechanism adapting gene activity to environmental conditions.
CORRECTIONS

Short- and Long-Term Operation of the Lutein-Epoxide Cycle in Light-Harvesting Antenna Complexes. Matsubara S., Morosinotto T., Osmond C.B., and Bassi R.

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